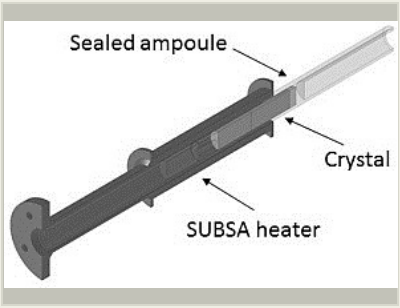
Crystal Growth of New Radiation Detector Materials in Microgravity, Phase I

Completed Technology Project (2017 - 2017)

Project Introduction

RMD proposes to conduct a series of crystal growth experiments on the International Space Station in the SUBSA furnace inside the MSG glovebox to grow crystals of new materials that have shown a good radiation detector response and present a commercial interest. There is a great demand for spectroscopic gamma-ray detectors capable of not only detecting presence and intensity of radiation, but also distinguishing the energy of an emitting isotope with high resolution. Another market is for solid-state neutron detection and dosimetry, where crystals can replace the difficult to obtain 3He gas. RMD is currently researching several detector crystals that have been developed to that stage: TlBr, SrI2:Eu, and 9,10-diphenylanthracene (DPA). These are detector materials of different types for specific applications: TlBr is a semiconductor for gamma-ray detection, SrI2:Eu is a scintillator for gamma-ray detection, and DPA is an organic scintillator for neutron detection. Crystal growth of these materials presents a number of challenges which limit the yield of high quality crystals or degrade their detector properties. The proposed microgravity research project will focus on developing a better understanding of the mechanisms that govern defect formation during crystal growth of these materials, and correlating those mechanisms to detector properties. RMD assembled a strong team of experts with significant experience in crystal growth and materials research in microgravity, who are very familiar with the equipment to be utilized for this project. Despite whether our hypotheses are confirmed or disproven, this series of crystal growth experiments in microgravity would allow us to determine which process parameters have the largest impact on quality and yield without interference from convection, in order to focus on optimization of those parameters, for improved production on Earth.



Crystal Growth of New Radiation Detector Materials in Microgravity, Phase I Briefing Chart Image

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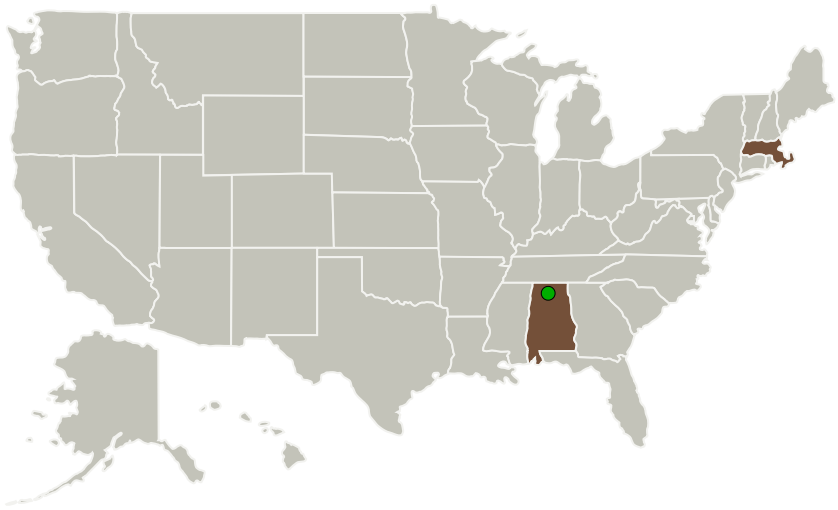
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Radiation Monitoring Devices, Inc.	Lead Organization	Industry	Watertown, Massachusetts
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Massachusetts

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Radiation Monitoring Devices, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

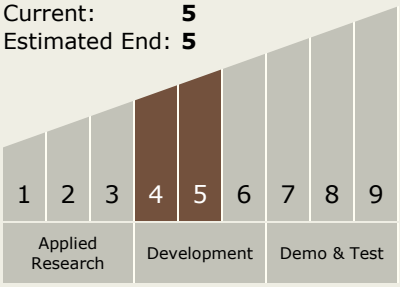
Carlos Torrez

Principal Investigator:

Alexei Churilov

Technology Maturity (TRL)

Start: **4**
Current: **5**
Estimated End: **5**



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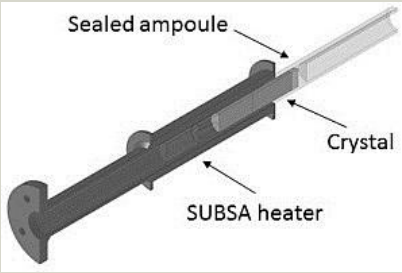
Images



Briefing Chart Image
Crystal Growth of New Radiation Detector Materials in Microgravity, Phase I Briefing Chart Image *(https://techport.nasa.gov/image/136734)*

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.2 Observatories
    - TX08.2.3 Distributed Aperture

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System